UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Platner	Group Art Unit:	3683
Serial No.:	10/656,925	Examiner:	Torres, M.
Filed:	09-05-2003		
Title:	COMPOSITE LEAF SPRING GEOMETRY WITH AN INTERLOCKING INTERFACE		

Commissioner for Patents
Mail Stop: Appeal Brief-Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

Appellant submits this Appeal Brief pursuant to the Notice of Appeal filed November 22, 2006 and the notice of non-compliance dated May 23, 2007.

REAL PARTY IN INTEREST

The real party in interest is **ArvinMeritor Technology, LLC**, assignee of the present application.

RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings related to, may directly affect or may be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1-10 and 12-33 are pending, rejected and appealed.

Claim 11 has been canceled.

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

Various conventional vehicle suspensions include a leaf spring fabricated from a series of superimposed steel leaves. Steel leaf springs may be disadvantageous because they are relatively heavy, noisy, and subject to corrosion. More recently, fiber reinforced resin composite materials have been utilized as a substitute for steel leaf springs. [¶2]

One difficulty includes the preference for avoiding mounting arrangements that require locating apertures through the composite leaf spring. Penetration of the composite leaf spring severs the fibrous materials and correspondingly reduces the physical characteristics of the spring. Conversely, elimination or minimization of apertures further decreases the mounting versatility for particular vehicle designs as specific metal end sections are utilized from frame rail mounting. That is, each leaf spring must be specifically tailored to a specific vehicle which may decrease the versatility of each leaf spring. [¶¶3-7]

The present application relates to a leaf spring suspension and, more particularly, to a composite leaf spring defining an infinitely variable interlocking locating segment for mounting an axle beam assembly to a vehicle. [¶1]

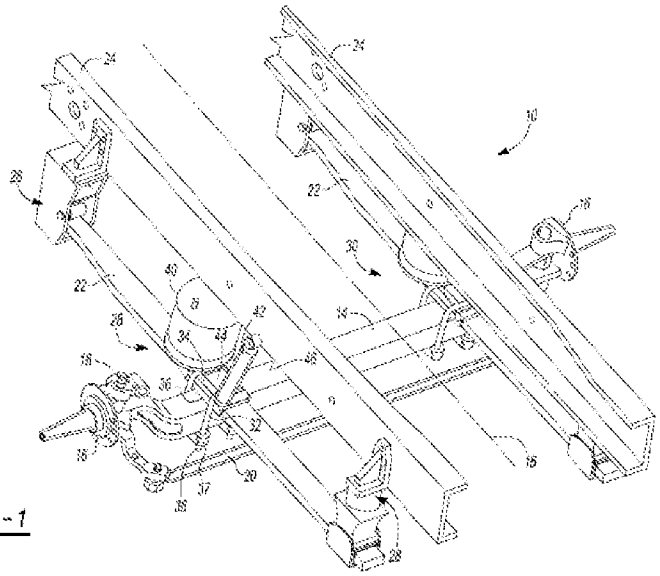


Fig-1

Figure 1 illustrates a general perspective view of a steerable air spring suspension system 10. The system 10 generally includes a primary structural support such as an axle beam 14. The axle beam 14 is preferably a single hollow square beam located transverse to a vehicle longitudinal axis 15. To dampen movement of the axle beam 14, a flexible member such as a composite leaf spring 22 is attached to longitudinal mainframes 24 which extend parallel to the vehicle longitudinal axis 15. The composite leaf springs 22 are attached to the mainframes 24 through a front leaf spring attachment system 26 and a rear leaf spring attachment system 28. An axle beam attachment system 30 attaches the axle beam 14 to each composite leaf spring 22 intermediate the attachment systems 26, 28. [¶¶28-30]

The axle beam attachment system 30 attaches the leaf spring 22 to the axle beam 14 through U-bolts 32 which sandwich the leaf spring between an upper clamp plate 34 and a lower clamp plate 36. The fastener plate 36 preferably straddles the open end of the U-bolts 32 to retain the axle beam 14. The axle beam attachment system 30 location in combination with the leaf spring shape defines the characteristics of the suspension system. [¶32]

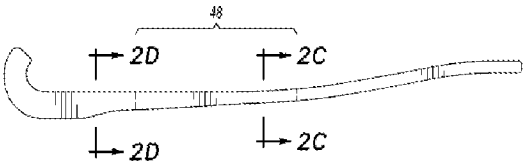


Fig-2A

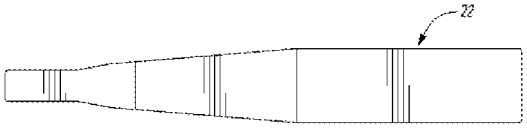


Fig-2B

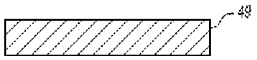


Fig-2C

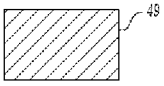


Fig-2D

Referring to Figure 2A, 2B, 2C and 2D, the leaf spring 22 includes a mounting segment 48 which engages the axle beam attachment system 30 (Figure 1) to provide an infinitely adjustable mounting location for infinite positioning of the axle beam 14 location setbacks to accommodate a multiple of vehicles. That is, the axle beam 14 may be located anywhere along the mounting segment 48 to provide a desired axle beam 14 setback. [¶35]

The mounting segment 48 provides a tapered width (Figure 2B) combined with an expanding depth. That is, within the mounting segment 48, the width is consistently decreasing as the depth is consistently increasing. Any position along the longitudinal length of the mounting segment 48 thereby provides a unique cross-sectional shape (49; Figure 2C) taken parallel to the axle beam 14. That is, any longitudinal position provides a unique combination of leaf spring width and leaf spring depth as illustrated by the different cross-sectional shapes illustrated in Figure 2C and 2D. Preferably, a cross-section parallel to the axle beam 14 taken

anywhere along the mounting segment 48 will provide a constant area of the cross-sectional shape 49. [¶36]

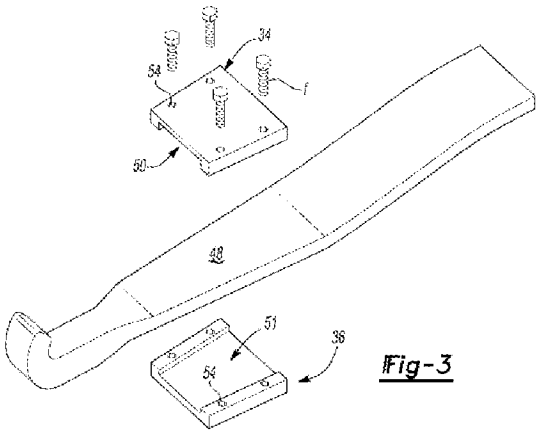


Fig-3

Referring to Figure 3, an interior cavity 50 of the upper clamp plate 34 and an interior cavity 51 of the lower clamp plate 36 defines the position of the axle beam attachment system 30 along the mounting segment 48. The interior cavities 50, 51 are each a generally U-shaped to correspond with the desired position along the mounting segment 48. The base of each interior cavities 50, 51 is angled relative to the interface between the plates 34, 36. That is, each interior cavity 50, 51 includes a tapered width and angled surface which corresponds to the leaf spring 22 width and depth for a predetermined mounting segment 48 longitudinal location (Figure 4). [¶37]

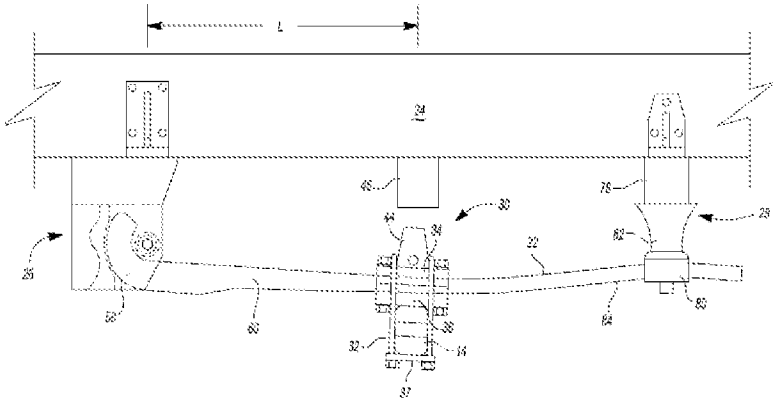


Fig-4

The upper clamp plate 34 and the lower clamp plate 36 can only be assembled to the leaf spring at a single predefined longitudinal location within the mounting segment 48. That is, the interior cavities 50, 51 provide a shape equivalent to the leaf spring 22 at the predetermined location for interlocking the axle beam attachment system 30 with the leaf spring 22 at that

predetermined location. As any longitudinal segment within the mounting segment 48 provides a singular cross-sectional shape, interior cavities 50, 51 defined for that shape will only properly fit at that predetermined location. The term "interlocking" as used herein defines the manner in which the axle beam attachment system will not slide along the leaf spring once assembled thereto due to the interface therebetween. [¶38]

The upper clamp plate 34 and the lower clamp plate 36 include matching apertures 54 for receipt of fasteners 56 such as bolts. The upper clamp plate 34 and the lower clamp plate 36 sandwich the leaf spring 22 within the interior cavity 50, 51. Once bolted together, the upper clamp plate 34 and the lower clamp plate 36 are interlocked onto the leaf spring 22 at the longitudinal position defined by the interior cavity 50, 51. That is, a leaf spring receipt cavity 52 (Figure 5) defined by a combination of interior cavities 50, 51 is unique to the leaf spring segment at the desired the axle beam attachment system 30 position to provide an interlocking interface therebetween. [¶39]

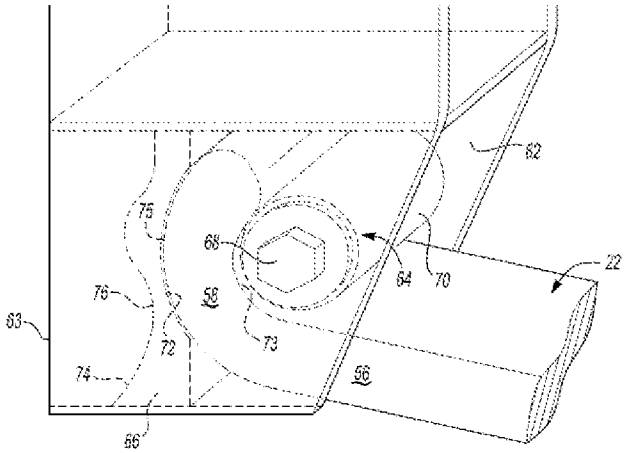


Fig-7

Referring to Figure 7, the front leaf spring attachment system 26 is illustrated. The forward leaf spring segment 56 of the leaf spring 22 preferably defines an arcuate segment 58. The arcuate segment 58 is essentially a hook or bend of at least approximately ninety degrees to a main longitudinal segment 60 (Figure 4) of the leaf spring 22. The forward segment is relatively thicker in depth due to the additional flexure stress at this attachment location. The front leaf spring attachment system 26 includes a bracket 62 mounted to the longitudinal

mainframes 24, a retaining pin 64 and a bumper 66. The bracket 62 is generally C-shaped (Figure 1) such that the opening thereof receives the forward leaf spring segment 56 of the leaf spring 22. The bumper 66 is located adjacent a rear wall 63 of the bracket 62 opposite the retaining pin 64. The bumper includes an arcuate face 72 to engage the arcuate segment 58 and a serpentine face 74 opposite the arcuate face 72. The serpentine face 74 engages a corresponding bracket serpentine 76 such that flexing of the leaf spring 22 will not displace the bumper 66. [¶¶41-44]

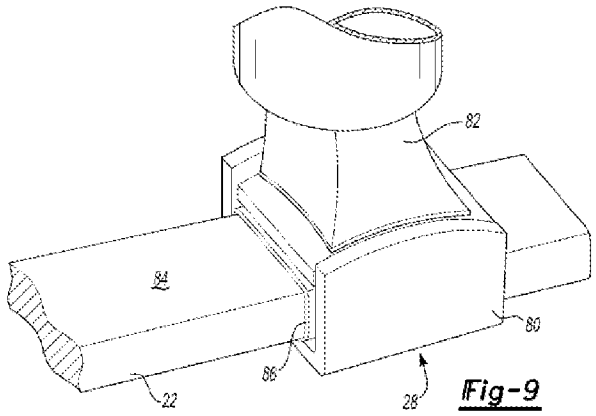


Fig-9

Referring to Figure 9, the rear leaf spring attachment system 28 is illustrated. The rear leaf spring attachment system 28 includes a rear bracket 78, a mount 80 and a shear damper 82 mounted therebetween. The mount 80 is preferably a rectangular tube to receive the rearward leaf spring segment 84. The rearward leaf spring segment 84 is mounted within a resilient bumper 86 or the like such that direct contact between the leaf spring 22 and the mount 80 is avoided. During flexing of the leaf spring 22, the rearward leaf spring segment 84 of the leaf spring 22 slides within the mount 80 and resilient bumper 86. The shear damper 82 further accommodates flexing of the leaf spring 22. As the leaf spring flexes, the shear damper 82 moves in shear in a direction substantially parallel to the longitudinal length of the leaf spring 22. That is, as the front leaf spring attachment system 26 effectively fixes longitudinal movement of the leaf spring 22, the rear leaf spring attachment system 28 needs to move in a longitudinal manner to accommodate the longitudinal lengthening of the leaf spring 22 as the leaf spring flexes toward a flatter arcuate geometry. The shear damper 82 in combination with sliding of the leaf spring 22 through the mount 80 accommodates this longitudinal length during flexing. [¶¶47-49]

Summary of Claim 1

Claim 1 recites:

1. A composite leaf spring comprising:

a forward leaf spring segment defining an arcuate segment;

a rearward leaf spring segment; and

a mounting segment intermediate said forward leaf spring segment and said rearward leaf spring segment, said mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth.

Thus, with reference to Figures 2A-2D, claim 1 recites said mounting segment 48 having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth. [See ¶36]

Summary of Claim 6

Claim 6 recites:

6. A suspension system comprising:

a composite leaf spring comprising a forward leaf spring segment defining an arcuate segment, a rearward leaf spring segment, and a mounting segment intermediate said forward leaf spring segment and said rearward leaf spring segment, said mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth; and

an axle beam attachment system defining a cavity engageable with said mounting segment at only a single predefined location along said mounting segment.

Thus, in addition to the limitations of claim1, claim 6 specifically recites the mounting segment 48 intermediate a forward leaf spring segment defining an arcuate segment 58 and a rearward leaf spring segment 84; and an axle beam attachment system 30 defining a cavity engageable with said mounting segment ***at only a single predefined location*** along said mounting segment.

Summary of Claim 15

Claim 15 recites:

15. A suspension system comprising:

a composite leaf spring comprising a mounting segment intermediate a forward leaf spring segment defining an arcuate segment and a rearward leaf spring segment the mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth; and

an axle beam attachment system which interlocks at a single predetermined location along said mounting segment.

Thus, in addition to the limitations of claim6, claim 15 recites the mounting segment 48 having a width and a depth, and ***a continuously variable cross-sectional shape*** in both said width and said depth; and an axle beam attachment system 30 which ***interlocks at a single predetermined location along said mounting segment.***

Summary of Claim 22

Claim 22 recites:

22. A method of mounting an axle beam to a composite leaf spring comprising the steps of:

(1) defining a mounting segment along a composite leaf spring comprising a tapering width and an expanding depth such that any cross-section taken perpendicular to the mounting segment and within the mounting segment has a width and a depth, and defines a singular cross-sectional shape in both said width and said depth;

(2) mechanically interlocking an axle beam attachment system with a cross-sectional shape at a single predetermined location along the mounting segment; and

(3) mounting an axle beam to the axle beam attachment system such that the axle beam is transverse to the composite leaf spring.

Thus, with reference to Figures 2A-2D, claim 22 recites mechanically interlocking an axle beam attachment system 30 with a cross-sectional shape at a single predetermined location

along the mounting segment 48 such that the axle beam 14 is transverse to the composite leaf spring.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Claims 1-10, 12-23, and 26-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Reast* (6962360) in view of *Cowburn* (4779894).

II. Claim 24 was rejected under 35 U.S.C. §103(a) as being unpatentable over *Reast* as modified above and further in view of *Constantinescu*.

ARGUMENT

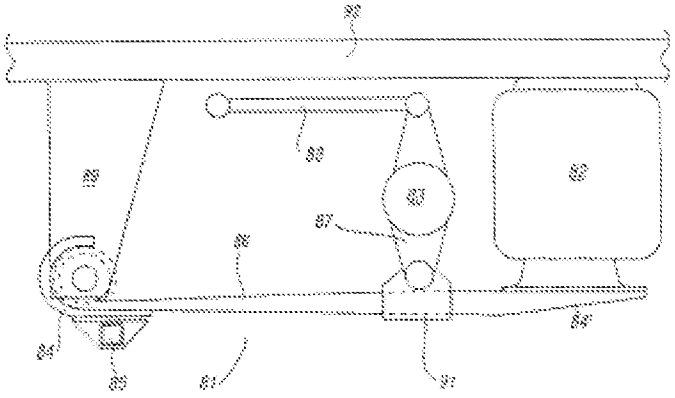
§103 Rejection

I. Obviousness Rejections Over *Reast* (6962360) in view of *Cowburn* (4779894)

Claims 1-10, 12-23, and 26-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Reast* (6962360) in view of *Cowburn* (4779894).

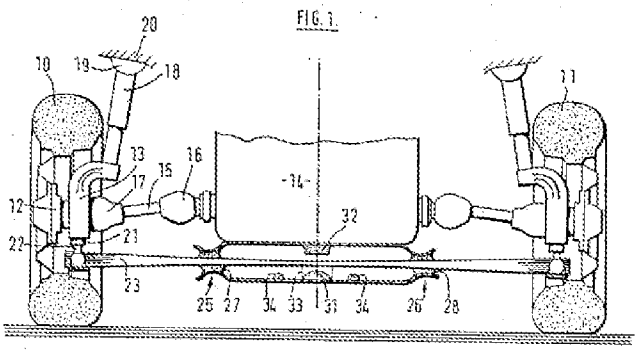
A. The combination of Reast (6962360) in view of Cowburn (4779894) is improper.

Appellant respectfully traverses these rejections as there is absolutely no teaching, suggestion, or motivation to modify *Reast* in view of *Cowburn* as proposed. *The Examiner admits that Reast does not teach wherein the mounting section has a continuous variable cross-sectional shape in both width and depth.* [8-24-06 Office Action p. 2]



The Examiner then argues that *Cowburn* teaches a mounting segment (30) intermediate forward and rearward leaf spring segments having a continuously variable cross-sectional shape in both *Cowburn* discloses:

> a spring 24 which ***extends transversely of the vehicl***e and is in the form of a one-piece element made of composite, fibre-reinforced plastics, material. The spring is connected ***at its free ends to the steerable wheel carrier members***, and it is supported, at two spaced positions 25, 26 between its ends, for limited pivotal movement about respective axes which extend longitudinally of the vehicle, i.e. transversely of the spring. ***The end portions, as 23, of the spring 24 are of increasing thickness and decreasing width towards their free ends, the cross-sectional area of such spring portions being constant or substantially so.*** Within the enclosure 29 between the support positions 25, 26, the spring is of constant width and of a thickness which decreases from the support positions to the centre of the spring, so that the stiffness of the spring in its principal direction of bending in use decreases towards the centre of the spring.
> *[See col. 3, lines 20-46; emphasis added]*



That is, *Cowburn*, at best, discloses a spring 24 which extends transversely of the vehicle such that the Examiner's interpretation of Cowburn having a mounting segment (30) intermediate ***forward*** and ***rearward*** leaf spring segments simply cannot be sustained. The Examiner's

interpretation of *Cowburn* is repugnant to the plain meaning thereof such that the rejections are improper for this reason alone.

Furthermore, the Examiner's proposed combination of such inherently different ***longitudinal*** – for a single wheel - versus ***lateral*** – between two wheels - references suggest that the only motivation to make the combination as proposed is by following the knowledge disclosed within the present application. That is, the Examiner utilizes the longitudinal air suspension of *Reast* with a lateral spring of *Cowburn* without any motivation therefor. This is impermissible usage of hindsight in an attempt to recreate Appellant's device. The failure to provide a proper combination between the references defeats the rejection and all claims are also allowable for this reason alone.

In yet another failing of the proposed combination, *Reast* discloses a leaf spring suspension arm 86 which is supported by an air spring 82 with an axle 83 therebetween. Conversely, *Cowburn* does not utilize an air suspension, but a lateral composite spring 23 transverse to a vehicle center line. As discussed above, but as specifically differentiated by the distinctly different suspension types, there is no motivation whatsoever to modify the air spring 82 suspension of Reast with a lateral composite spring 23 of *Cowburn*. Once again, these significant structural distinctions between the suspension types of *Reast* and *Cowburn* further support Appellant's argument that the Examiner is utilizing hindsight in an attempt to recreate Appellant's device.

All claims are therefore properly allowable as the combination is improper.

B. The Combination Fails To Disclose the Claimed Limitations.

Even if the combination were properly made, there are differences between the claimed application and the teaching of the cited references so that the combination does not meet the limitation of Appellant's claims.

Claim 2

Claim 2 recites wherein any cross-section taken perpendicular to said mounting segment and within said mounting segment defines a substantially equivalent cross-sectional area. The proposed combination fails to disclose or suggest any mounting segment which defines an area in which any

cross-section taken perpendicular to said mounting segment provides a substantially equivalent cross-sectional area.

Claim 4

Claim 4 recites wherein said rearward leaf spring segment defines a first arc in a first direction and said forward leaf spring segment defines a second arc in a second direction. The proposed combination fails to disclose such forward and rearward leaf spring segments. Furthermore, the terminology of forward and rearward in the proposed combination is unclear considering *Reast* utilizes a longitudinal spring while *Cowburn* uses a lateral spring such that the Examiner's proposed combination is unclear even with regard to such a basic relationship.

Claim 5

Claim 5 recites wherein said forward leaf spring segment is thicker in depth than said rearward leaf spring segment. The proposed combination is also unclear as described with regard to claim 4.

Independent Claim 6 is Patentable Independent of the Other Independent Claims.

Independent claim 6 recites an axle beam attachment system defining a cavity engageable with said mounting segment at ***only a single predefined location***. *Reast* discloses an axle mounting system, yet *Cowburn* utilizes a mounting system to mount a spring 24 to an engine-transmission unit 14 and not the drive shafts 15. Thus, even if the combination were proper – which it is not – the mounting arrangement of *Cowburn* would not be utilized for an axle mount but for a structural mount such as *Reast* [89]. The claim is properly allowable.

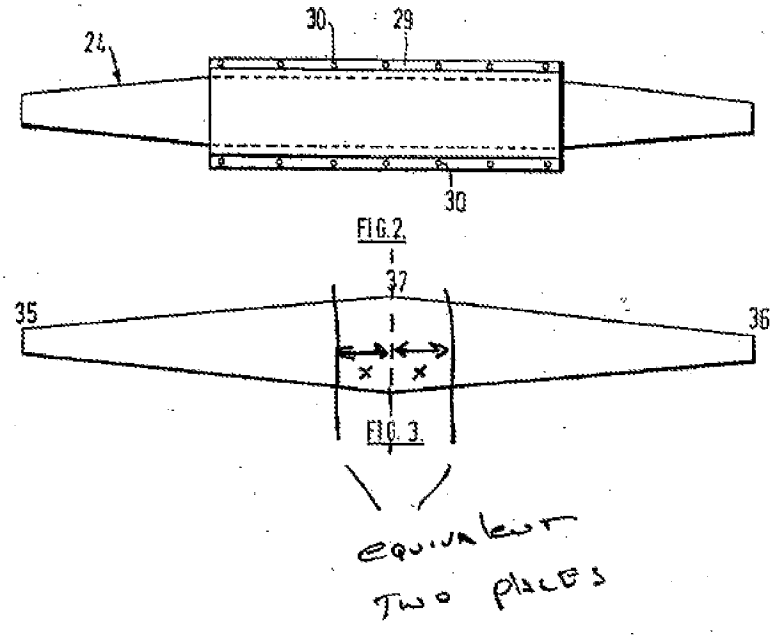
Independent Claim 15 is Patentable Independent of the Other Independent Claims.

Independent claim 15 recites an axle beam attachment system which interlocks at a single predetermined location along said mounting segment. As described above with regard to claim 6, claim 15 recites an interlock at a single predetermined location. Thus, even if the combination were proper – which it is not – the proposed combination, fails to disclose or suggest an interlock as recited in independent claim 15. That is, the proposed combination does not disclose or suggest interlocking an axle beam through an axle beam attachment system.

Claim 16

Claim 16 recites wherein said mounting segment width comprises a tapering width and said mounting segment depth comprises an expanding depth such that any cross-section taken

perpendicular to said mounting segment and within said mounting segment provides a singular cross-sectional shape. Even if the combination were proper – which it is not – the Examiner relies upon *Cowburn* for the teaching of a continuously variable cross-sectional shape. However, as illustrated in the annotated Figure 3 below, *Cowburn* fails to disclose or suggest that any cross-section taken perpendicular to said mounting segment and within said mounting segment provides a ***singular*** cross-sectional shape. That is, for example, the two cross-sections Appellant has utilized to annotate Figure 3 would be equivalent. As such, *Cowburn* simply cannot meet the limitation of any cross-section taken perpendicular to said mounting segment and within said mounting segment provides a singular cross-sectional shape.



Claim 17

As discussed above, the mounting section of *Cowburn* also cannot disclose or suggest any cross-section taken perpendicular to said mounting segment within said mounting segment defines a cross-sectional area equivalent to any other cross-section taken perpendicular to and within said mounting segment. That is, as further annotated, the cross-section taken in any location which is not distance X from the centerline of the spring 24 would not have a cross-sectional area equivalent to the cross-section at, for example, cross-section X.

Independent Claim 22 is Patentable Independent of the Other Independent Claims.

Claim 22 is a method claim which recites mounting an axle beam to the axle beam attachment system such that the axle beam is transverse to the composite leaf spring. As described above, the axle beam may be transverse to the leaf spring in *Reast*, but is not transverse in *Cowburn.* Furthermore, claim 22 recites mechanically interlocking an axle beam attachment system. Such description further distinguishes Appellant's claim 22 from the proposed combination as the proposed combination simply fails to disclose or suggest such a mechanical interlock for an axle beam attachment system.

Claims 31-33

Claims 31-33 each depend respectively from independent claims 1, 6, and 15 and recite wherein said continuously variable cross-sectional shape is defined such that any cross-section taken perpendicular to the mounting segment and within the mounting segment provides a singular unique cross-sectional shape within said mounting segment. As described above, the proposed combination fails to disclose or suggest a singular unique cross-sectional shape within said mounting section as illustrated above in the annotated Figure 3. These claims are also properly allowable.

II. Obviousness Rejection Over *Reast* in view of *Cowburn* and further in view of *Constantinescu*

Claim 24 was rejected under 35 U.S.C. §103(a) as being unpatentable over *Reast* as modified above and further in view of *Constantinescu*.

A. Constantinescu is not analogous art.

Constantinescu describes box spring and the like for bedding and furniture.

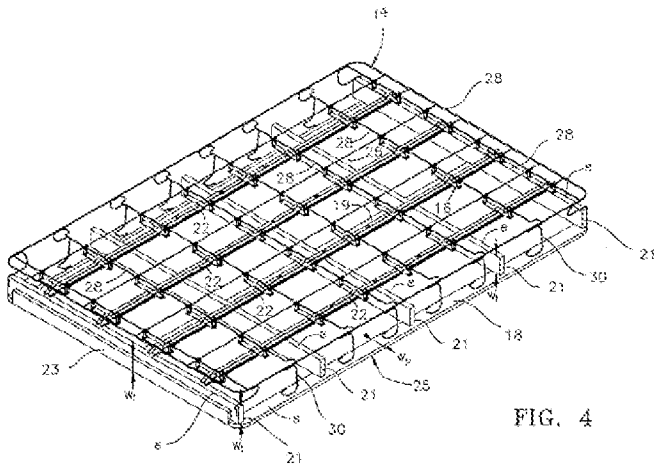


FIG. 4

In order to rely on a reference as a basis for rejection of an Appellant's application, the reference must either be in the field of Appellant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). Under no just interpretation would *Constantinescu* be in Appellant's field of endeavor or be reasonably pertinent to the particular problem that the Appellant has solved. As just one example, the very different weights involved would never lead a suspension engineer to investigate box spring mattress designs. Under no just interpretation would *Constantinescu* be in Appellant's field of endeavor or be reasonably pertinent to the particular problem that the Appellant has solved. *Constantinescu* is not analogous art to *Reast*, *Cowburn* or Appellant's application. The proposed combination is improper.

b. The combination of *Reast* in view of *Cowburn* and further in view of *Constantinescu* is improper.

Aside from the non-analogous argument discussed above, the rejection of claim 24 fails for at least the reasons discussed above with regard to *Reast* in view of *Cowburn*. Claim 24 is therefore properly allowable for at least these reasons.

CONCLUSION

For the above reasons, the rejections by the Examiner should be reversed. The Commissioner is authorized to charge the $500 appeal brief fee to Deposit Account no. 50-1482. If any additional fees or extensions are due, please charge Deposit Account No. 50-1482.

Respectfully Submitted,

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Dated: June 14, 2007

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CLAIMS APPENDIX

1. A composite leaf spring comprising:

a forward leaf spring segment defining an arcuate segment;

a rearward leaf spring segment; and

a mounting segment intermediate said forward leaf spring segment and said rearward leaf spring segment, said mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth.

2. The composite leaf spring as recited in claim 1, wherein any cross-section taken perpendicular to said mounting segment and within said mounting segment defines a substantially equivalent cross-sectional area.

3. The composite leaf spring as recited in claim 1, wherein said mounting segment width comprising a tapering width and said mounting segment depth comprising an expanding depth.

4. The composite leaf spring as recited in claim 1, wherein said rearward leaf spring segment defines a first arc in a first direction and said forward leaf spring segment defines a second arc in a second direction.

5. The composite leaf spring as recited in claim 1, wherein said forward leaf spring segment is thicker in depth than said rearward leaf spring segment.

6. A suspension system comprising:

a composite leaf spring comprising a forward leaf spring segment defining an arcuate segment, a rearward leaf spring segment, and a mounting segment intermediate said forward leaf spring segment and said rearward leaf spring segment, said mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth; and

an axle beam attachment system defining a cavity engageable with said mounting segment at only a single predefined location along said mounting segment.

7. The suspension system as recited in claim 6, wherein said mounting segment width comprises a tapering width and said mounting segment depth comprising an expanding depth.

8. The suspension system as recited in claim 6, wherein any cross-section taken perpendicular to said mounting segment and within said mounting segment defines a cross-sectional area equivalent to any other cross-section taken perpendicular to and within said mounting segment.

9. The suspension system as recited in claim 6, wherein said axle beam attachment system comprises a mount attached to said composite leaf spring.

10. The suspension system as recited in claim 9, wherein said mount is an integral portion of said composite leaf spring.

12. The suspension system as recited in claim 9, wherein said mount comprises an upper clamp plate and a lower clamp plate, said upper clamp plate defines a first interior cavity and said lower clamp plate defines a second interior cavity, wherein a leaf spring receipt cavity comprised of said first and second interior cavities corresponds to a leaf spring width and a leaf spring depth for attaching said mount at said single predetermined location along said mounting segment.

13. The suspension system as recited in claim 6, further comprising an upper clamp plate and a lower clamp plate which defines said cavity when mounted together.

14. The suspension system as recited in claim 13, wherein said upper clamp plate and said lower clamp plate sandwich said composite leaf spring.

15. A suspension system comprising:

a composite leaf spring comprising a mounting segment intermediate a forward leaf spring segment defining an arcuate segment and a rearward leaf spring segment the mounting segment having a width and a depth, and a continuously variable cross-sectional shape in both said width and said depth; and

an axle beam attachment system which interlocks at a single predetermined location along said mounting segment.

16. The suspension system as recited in claim 15, wherein said mounting segment width comprises a tapering width and said mounting segment depth comprises an expanding depth such that any cross-section taken perpendicular to said mounting segment and within said mounting segment provides a singular cross-sectional shape.

17. The suspension system as recited in claim 15, wherein any cross-section taken perpendicular to said mounting segment and within said mounting segment defines a cross-sectional area equivalent to any other cross-section taken perpendicular to and within said mounting segment.

18. The suspension system as recited in claim 15, wherein said axle beam attachment system defines a cavity which surrounds a singular segment within said mounting segment to interlock said axle beam attachment system with said composite leaf spring.

19. The suspension system as recited in claim 18, further comprising a plurality of plates which define said cavity.

20. The suspension system as recited in claim 19, wherein said plurality of plates are fastened together to define said cavity.

21. The suspension system as recited in claim 19, further comprising an axle beam mounted to at least one of said plurality of plates.

22. A method of mounting an axle beam to a composite leaf spring comprising the steps of:

(1) defining a mounting segment along a composite leaf spring comprising a tapering width and an expanding depth such that any cross-section taken perpendicular to the mounting segment and within the mounting segment has a width and a depth, and defines a singular cross-sectional shape in both said width and said depth;

(2) mechanically interlocking an axle beam attachment system with a cross-sectional shape at a single predetermined location along the mounting segment; and

(3) mounting an axle beam to the axle beam attachment system such that the axle beam is transverse to the composite leaf spring.

23. A method as recited in claim 22, wherein said step (2) further comprises attaching an upper and lower plate together to define a cavity equivalent to the cross-sectional shape at the single predetermined location to at least partially surround and mechanically interlock the axle beam attachment system with the composite leaf spring.

24. A method as recited in claim 22, wherein said step (2) further comprises overmolding a molded material at the single predetermined location along the mounting segment to interlock the molded material with the composite leaf spring.

25. The composite leaf spring as recited in claim 1, wherein said arcuate segment defines a bend of at least ninety degrees.

26. The composite leaf spring as recited in claim 1, wherein said width of said mounting segment is constantly decreasing as said depth of said mounting segment is constantly increasing toward said rearward leaf spring segment.

27. The composite leaf spring as recited in claim 1, wherein said forward leaf spring segment is of a greater depth and of a lesser width than said rearward leaf spring segment.

28. The composite leaf spring as recited in claim 1, wherein said rearward leaf spring segment is of constant depth and width throughout a length thereof.

29. The composite leaf spring as recited in claim 1, wherein said forward leaf spring segment, said rearward leaf spring segment, and said mounting segment are manufactured of a substantially solid composite material.

30. The suspension system as recited in claim 6, wherein said cavity defines a shape that corresponds to a cross-sectional shape of the mounting segment at said single predefined location.

31. The composite leaf spring as recited in claim 1, wherein said continuously variable cross-sectional shape is defined such that any cross-section taken perpendicular to the mounting segment and within the mounting segment provides a singular unique cross-sectional shape within said mounting segment.

32. The suspension system as recited in claim 6, wherein said continuously variable cross-sectional shape is defined such that any cross-section taken perpendicular to the mounting segment and within the mounting segment provides a singular unique cross-sectional shape within said mounting segment.

33. The suspension system as recited in claim 15, wherein said continuously variable cross-sectional shape is defined such that any cross-section taken perpendicular to the mounting

segment and within the mounting segment provides a singular unique cross-sectional shape within said mounting segment.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.